

slot 51. When the pen 106a reached position F, the level switch 113 again closed the contact 115 and moved the table to the next slot position which, as shown in FIG. 14, contained a collection bottle.

The cycle continued in this manner until the roller 84 on the lever arm reached the return clip 57' whereupon the switch 88 was closed causing relay 110 to close contact 112 and initiate the recycling control 108. The table continued to rotate, and the roller 84 passed the remaining slots in which by-pass clips were positioned until it returned to the start position in slot C.

The recycle control 108 then initiated the following steps: it opened the line to the recorder level switch to prevent initiation of movement of the table during the first stages of the recycling process, opened the oven door for cooling the oven and turned off the oven heater. The recycle control also caused the syringe 101 to be refilled and started a cool down timer which ran until the oven had cooled down to proper temperature for initiation of a new cycle. When the cool down timer had run, the oven door was then closed, the oven heater turned on, the sample injected into the column 102 and a precollection timer initiated. After the precollection timer had run, the line to the recorder level switch was closed so that the recorder was again in control of the collection process and initiated movement of the collection table when the recorder pen passed the recorder level switch.

As apparent from the above, when the present invention is utilized, on-column injections and automatic temperature programming of the chromatograph are possible. In the particular example given above a column  $\frac{3}{8}$ " x 10' was used with substrate SE-30—30% on 60/80 firebrick and a helium flow rate of 200 ml./m. In repetitively temperature programmed cycles from 70 to 200° C. the time of each cycle was 20 minutes with a column heat up time of 8 minutes and a column cool down time of 12 minutes. Each peak including the small C<sub>10</sub> peak was individually collected by refrigerating the collection bottles at 0° C. and gave better than 90% recoveries.

The collection bottles described above are extremely efficient and operate at room temperatures for materials boiling above 100° C. Both liquids and gases are collected in the bottles; the gases passing to the upper chamber 62 condense and return to the lower chamber 63. Typically, samples are removed from the bottles, after centrifugation, with an eye dropper drawn to a capillary.

The waste between two collected components may be collected by placing a collection bottle in the waste position slot. Alternatively, if a by-pass clip is positioned in two waste positions the waste will be collected in the collector bottle therebetween and the next component will be collected in the next collector bottle.

Any position may be by-passed by positioning one of the by-pass clips 57 in that slot, and the clips 57 and 57' may be utilized in a number of different ways by a person skilled in the art to produce different desired results.

As is apparent from the above the single collection table is constructed to perform a number of functions thereby avoiding the necessity of providing other complex timing wheels. The table 14 provides the slots for controlling the timing steps of the collection process to rotate and raise and lower the wheel and for either holding a collection bottle or serving as a waste hole. The slots also serve in combination with the indexing rollers for precisely aligning the bottles with the discharge tube.

Obviously in the broadest aspects of the invention the bottle supporting means need not be a circular table but may be any mechanism for advancing and raising and lowering the collection bottles for sealing onto the discharge tube during collection of a component. However, the circular table provides a number of advantages. It provides a simple compact construction providing all the functions mentioned above and permits easy refrigeration of the bottles since no interfering apparatus extends below the table.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

We claim:

1. Sample collection apparatus in combination with a chromatograph including a plurality of collection bottles each having an inlet opening; means for supporting said collection bottles with the inlet opening directed vertically; a fluid discharge tube connected to the column of the chromatograph, positioned spaced from said bottle support means and adapted successively to pass the different fluid components of a sample passed into said chromatograph; and means for alternately horizontally moving and raising and lowering said bottle support means to seal the output end of said discharge tube successively to the inlet opening of each of said collection bottles to collect the desired components passing out of said discharge tube in time spaced intervals in separate collection bottles.

2. The apparatus of claim 1 including pressure exit means for relieving pressure within each of said bottles when the output end of said discharge tube enters each of said bottles whereby the desired components passing out of said discharge tube at time spaced intervals are collected in separate collection bottles under normal pressure, said pressure exit means including an outlet opening in each of said bottles located above the collection level for the fluid components in said bottle and gas pervious means located between said inlet opening and said outlet opening for passing out of each of said bottles during filling substantially only carrier gas and the gas originally contained within said bottle.

3. The apparatus of claim 1 including means for detecting the different components successively passing through said discharge tube, said moving, raising and lowering means being responsive to said detecting means to cause desired components to be collected in said separate collection bottles.

4. The apparatus of claim 3 characterized further in that said moving, raising and lowering means including means for returning said bottle support means to initial position after given components have been collected in separate bottles and means for inserting additional sample into said chromatograph, said detecting means and said moving, raising and lowering means responsive thereto causing each of said separate collection bottles to fill with one of said given components.

5. The apparatus of claim 1 including a sealing cap on the inlet opening of each of said bottles, a tubular needle insert provided on the output end of said discharge tube for piercing said sealing cap on the top of the collection bottles, said needle insert provided with a V-shaped groove on the tip thereof to prevent pressure surges when said needle insert pierces said sealing caps.

6. The apparatus of claim 1 wherein said collection bottle support means includes a circular table horizontally supported on a drive shaft, said table having a plurality of radial slots spaced about the periphery thereof and extending inwardly from the periphery a substantially equal length to a circle concentric with said drive shaft, each of said slots constructed and arranged to support one of said collection bottles and said moving, raising and lowering means includes a lever arm rotatably supported on said frame, said lever arm provided with a roller portion engaging the periphery of said table and partially rollable into said slots in said table, and means responsive to the position of said lever arm for stopping rotation of said drive shaft when the roller portion of said lever arm rolls into the initial portion of one of said slots and for moving said table vertically to cause said discharge tube to extend into one of said bottles.

7. The apparatus according to claim 1 including a plurality of collection bottles, each of said bottles having an